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ABSTRACT

This document reports two literacy task analyses conducted in Burnaby, British Columbia, on a job site designated "large" and another considered "small." The report of the analysis of the "large" job site: (1) describes the goals of the analysis, which include identifying the basic skills required for the jobs studied and assessing the usefulness of literary task analysis as a means of clarifying training requirements in a construction setting); (2) describes its process; (3) profiles the carpenter, junior carpenter foreman, senior carpenter foreman, and carpenter foreman positions; (4) describes the job skills education program; (5) describes the job learning analysis method regarding each position; (6) points out the similarities and differences in the foremen's skills; (7) makes recommendations for training; (8) provides a summary of recommendations; and (9) offers a conclusion. The smaller site's report sections are similar, although the goals of the project and some of the positions analyzed are different. Among the goals were to identify similarities and differences between job requirements of tradespersons working for a large construction company and those working for a smaller construction company. The jobs analyzed are carpenter apprentice, carpenter superintendent, carpenter foreman, and carpenter. (CML)

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Sample

LITERACY TASK ANALYSIS

Carpenter

Carpenter Foreman

Carpenter Apprentice

Carpenter Superintendent

CE 062 173

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Part I

DETERMINING WORKPLACE BASIC SKILLS

A LITERACY TASK ANALYSIS (LTA)

OF

THE CARPENTER

AND THE

CARPENTER FOREMEN
(3 levels)

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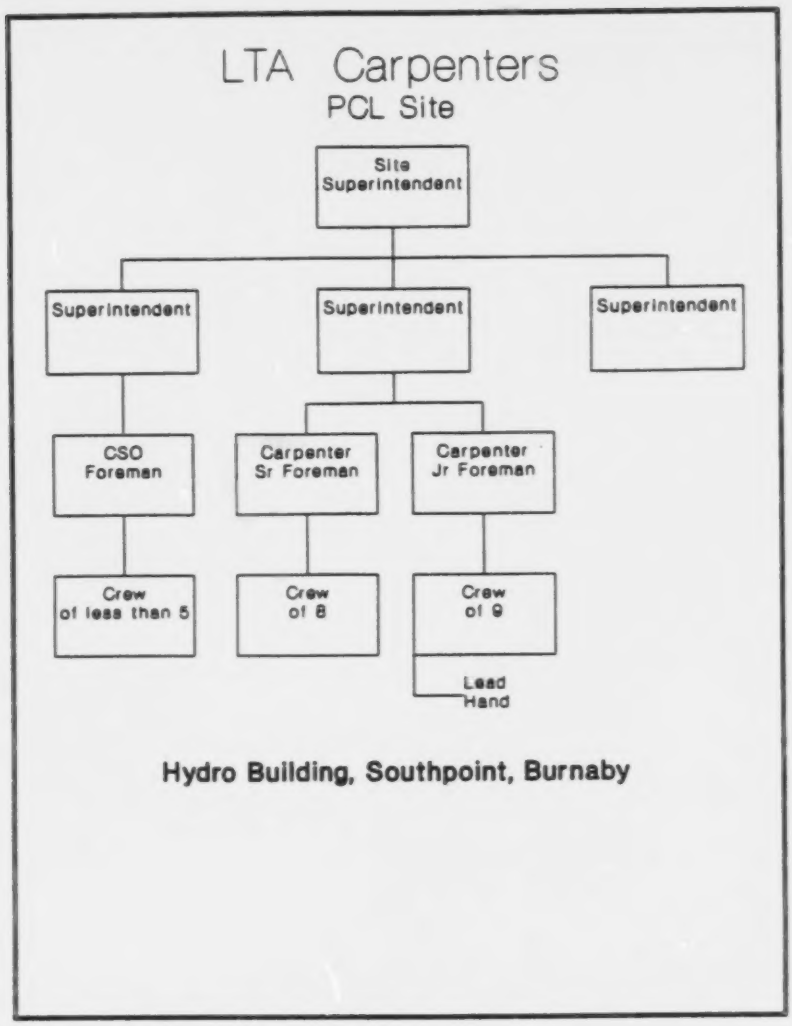

Hydro Building, Southpoint, Burnaby

The Literacy Task Analysis was carried out at the PCL (BC Hydro) project at 19th Street and Southpoint Drive, Burnaby, B.C.

The Analysis was carried out by Glenda Lewe, Skills Analyst, seconded to *SkillPlan* through the Building and Construction Trades Department, AFL/CIO, Canadian Office, and Lynda Fownes. Research Director, *SkillPlan* during the week of May 11, 1992.

SkillPlan acknowledges the assistance of the following persons who made this analysis possible:

Bob Morrison, Vice President, CLRA, and Bob Whitaker, Co-ordinator, Carpentry Apprenticeship and Training Committee, United Brotherhood of Carpenters for their interest and their assistance in obtaining approval to conduct this project;

Dave Langevin, Site Superintendent, PCL, for his cooperation in making the worksite available to the analysts and for his insightful comments on training; and Rob Ireland, Superintendent, PCL, for his assistance in preparing and facilitating the efficient operation of the interview and observation schedule.

GOALS OF THE PROJECT

(a) to determine the basic skills required for the jobs of Carpenter and Carpenter Foreman and to identify the skill gap between the two jobs in order to better target training needs;

(b) to examine the functions of a CSO when combined with a Carpenter Foreman position to determine additional training needs;

(c) to assess the usefulness of Literacy Task Analysis as a means of clarifying training requirements in a construction setting.

THE PROCESS

Four PCL employees were interviewed and observed.

These employees occupy the following positions:

- Carpenter
- Carpenter Foreman - Senior
- Carpenter Foreman - Junior
- Carpenter Foreman combined with CSO

The first set of interviews focused on each employee describing his job, aided by the questions of the Structured Job Analysis Interview (See Appendix 1). Each interview took approximately one hour.

The Observation phase took place on a subsequent day, and consisted of watching the Carpenter and the two Foremen perform the functions of "flying the tables" (moving forms for concrete). In the case of the Foreman/CSO, the observation phase consisted of escorting the Foreman/CSO on his daily site tour.

A final interview took place on the day following the observation. The purpose of the second interview was for the analysts to gain insight into points requiring clarification and to apply an additional information gathering technique - the Job Learning Analysis Grid. This interview concluded with a verification of the Job Skills Education Program (JSEP) prescription developed for the Carpenter through task analysis in the United States.

PROFILE OF THE CARPENTER

This is a job requiring strong math skills, a good memory, and a high degree of teamwork. Physical fitness is essential to accommodate lifting and carrying.

The Carpenter works with only light supervision, since "we know what we are going to do and we do it."

Blueprints are usually interpreted to the Carpenter through drawings made by the foreman. In turn, the Carpenter will sometimes make drawings for apprentices.

Reading and writing requirements are light. Safety meeting reports circulated at lunch make up the most concentrated reading of the Carpenter. There are no forms, time sheets,etc. to fill in, since that is done by the Foreman.

Math skills are extremely important and diverse, covering measurement (both Imperial and Metric), and a range of functions in geometry, fractions and decimals. (See Section on JSEP prescription.)

Team work is a major asset. The Carpenter must be accurate, professional and organized. Timing is important. The job requires a minimum of two to three years to be properly mastered.

It is important to have strong visual sense in order to know if items are level. For non-typical parts of the building, it will be necessary to consult the blueprints. The Carpenter does not always know how to read the blueprints. This potential difficulty is overcome because: "There's a shack and drawings are always there. There's always someone who can read them."

The Carpenter is a resource for some of the other trades who do not use the Skillsaw. They come to the Carpenter for assistance.

The Carpenter interviewed for this analysis is a member of a team. On the job observed, he generally works with nine people on the crew for the tower. On the day that the flying of the tables occurs, he is a member of a composite crew. Contacts are with all trades, particularly Electricians, Plumbers and Iron Workers.

Safety consciousness is a must for the Carpenter - particularly in regard to fall protection. It is also important to be aware of toxic substances such as the form oil which is put on plywood. Safe operating of power equipment is also necessary.

Memory is important. Since very little is written down, a process, once done, must be remembered for the next time.

Some Carpenters operate a woodworking business as a sideline. Job costing and estimating thus become part of their expertise.

PROFILE OF THE JUNIOR CARPENTER FOREMAN

This Foreman was a Carpenter for 15 years and a lead hand for two years before becoming a Foreman a year ago. He sees his key role as getting the work done - motivating the crew to accomplish a certain amount of work in a fixed amount of time.

Main duties include organizing crane time and coordinating the trades. Another duty is to make personal safety equipment available to his crew (goggles, gloves, etc.).

A certain amount of independent judgement is permitted. This has permitted this Foreman to use a new and adapted system for stripping the forms. This system is faster and uses fewer workers.

Like the senior Carpenter Foreman interviewed, this Foreman draws up sketches relating to details of the work to be accomplished. The sketch interprets the blueprints to the worker and shows how it is to look when it is done. The Foreman sometimes does these sketches at home.

Memos are received several times a week, but rarely are written by the Foreman. Notes often refer to changes on upcoming floors, or some additional detail that has been added. The changes generally are from the owner, architect or subtrades.

Math requirements include: framing square usage, measurements including conversion between imperial and metric; drawing data from drawings: heights, grid lines and elevations; estimating materials and quantities; volumes, and fractions, decimals and averages.

The blueprinting reading function has many elements. It is not just reading one set of blueprints but reading as many as four and assimilating the information. This Foreman sometimes spends two hours at home looking at drawings. Each drawing is specific to the individual job. There is some blueprint reading in the apprenticeship program but many tradesmen cannot read the prints totally. This places the total responsibility on the Foreman.

There is not much writing on the job. The Foreman must write up accident reports on rare occasions.

While only grade 10 is required to enter apprenticeship, this Foreman feels that grade 12 math is essential to do a good job as a Carpenter.

Organizational skills are important for the Foreman and the setting of priorities. It is necessary to see the whole picture - what's good for the whole crew and for the other trades.

Planning for up to three weeks in advance is necessary. When the 16th floor is being done the Foreman is planning for the 21st floor. Materials have thus been ordered and are on site and the necessary approvals have been obtained.

There are daily contacts with other Carpenter Foremen, Labourer Foremen and Rebar Foremen and the rigger. Radio contact is frequent as the Foremen "work things out". One third of the day may be spent in this way. Contact with the superintendents is infrequent and usually takes place before and after work (15 minutes) or on request. There are also contacts with the CSO Carpenter Foreman and with WCB inspectors. This Foreman has no contact with the architects and engineers.

This Foreman appreciates the degree of autonomy he receives on the job and the opportunity for independent decision making.

Teamwork is exhibited in a number of ways. Establishing who has priority over the crane is an example. The crane time is scheduled through the superintendent, and the Foreman negotiates to some extent as needed with the rigger (labourer).

This Foreman spends about one half hour a day in the office, generally to use the phone.

PROFILE OF THE SENIOR CARPENTER FOREMAN

The Foreman interviewed for this analysis had been a Carpenter for nineteen years and a Foreman for five.

Directing the eight workers supervised is the major component of this job. The Foreman judges how many people will be required for the job. He makes sure that time lines are respected and that resources and materials are obtained. Ordering of the necessary supplies such as nails, snap ties, wood etc, is done by the superintendent after these needs have been identified by the Foreman. Planning for supplies is generally done two weeks ahead.

The Foreman uses tools, but only on occasion since this is not part of the job. There is some pushing and lifting, but this is also rare. Working the radio to direct the rigger is the Foreman's method of getting supplies to the top.

Reading and writing is much more prevalent for the Foreman than for the Carpenter. The Foreman has a box in the site trailer and must read change orders placed in the box by the superintendent. Messages are brief and generally hand written. Blueprint reading is an important element of the Foreman's job. There are also reports to fill in. Time cards are written up every night using codes.

The Foreman needs to know all the maths that the Carpenter needs to know. Most used on the job are measuring, adding and subtracting numbers on drawings and taking elevations using survey equipment.

The Carpenter Foreman uses diagrams and blueprints every day, particularly for "taking heights". (The blueprint provides the top elevation, tells the depth of the slab, where the concrete goes, where items are for the electricians, etc.) He regards the blueprint as the Bible. Anticipating problems on the blueprints is an important skill of the Foreman - e.g. - determining that a beam wouldn't fit. The Foreman brings discrepancies in the prints to the attention of the superintendent.

Interpreting the prints to the Carpenters is done on a frequent basis. This involves making elevation drawings, sometimes on wood, sometimes on paper) and doing a small drawing of what they will be doing. This reinterpretation makes the drawing dimensional. The Foreman does structural drawings, davit based drawings, drawings for curtain walls and form drawings,

The Foreman plays a key role in assessing the accuracy of work completed. Sometimes, a one inch error will not make a difference;sometimes it will. The Foreman must know when a slight error will cause problems down the road for the subtrades. Judgement calls are made every day.

The Carpenter Foreman has daily contact with the superintendent and is told the "where" and the "when" but not the "how". Supervision is light, with the supervisor coming to the job site generally only once a day (unless things start going wrong).

The Foreman must set priorities and decide how to reach goals. Some Foremen are "on the job" planners while others are better at long range organizing.

The Foreman must enforce the safety procedures set out by the WCB. This is important because if grey areas are ignored the company will be fined or injuries or fatalities may occur.

Contacts are broad ranging. Contact is from Foreman to Foreman but also with Ironworkers, Electricians, Plumbers, Labourers, Cement Finishers, Sheet Metal Workers and Steel Inspectors.

Timing is one of the central aspects of the job. If one part of the job falls behind, another must be postponed. This can cost money and result in sending back concrete. Coordination on the radio crosstrades helps to keep jobs on track.

The Carpenter Foreman is a negotiator, seeking consensus with other Foremen.

This job functions through strong reliance on personal contact with a wide circle of trades. Sometimes there is contact with engineers and architects.

Up to 15 or 20 per cent of this Foreman's time may be spent in the office, although for some other Foremen the percentage is higher.

Generally the Carpenter Foreman works with seven to twelve Carpenters. Space is generally open rather than cramped. Some jobs become routine, but that differs from job to job.

PROFILE OF CARPENTER FOREMAN (CSO)

The Foreman interviewed has owned his own business and has performed a diversity of jobs in that role. His assignment follows the same variety of responsibilities. One of attributes necessary for his position is the ability to be flexible, as duties change from day to day.

The function he serves in all his roles is organizing and controlling. He organizes tasks through the whole building.

His main duties include Construction Safety Officer, responsibility for the man hoist, organizing materials, organizing finishing details, installing plastic on windows, and training a first aid person to be a safety officer.

Because of the duties involved, this Foreman must prioritize on a daily basis and be able to respond to situations as they arise. Scheduled non routine is part of the job. For example, the site safety inspection is done at random times and varying routes as a way of insuring safety alertness.

While the actual lifting, pushing and carrying exists in the job, perhaps for 10% of the time, general physical fitness is very important to this position. A doctor's certificate is required. The size of the site demands a considerable amount of walking and climbing of stairs.

Unlike the other Foremen interviewed, this Foreman is a "working" Foreman as he supervises fewer than 5 workers.

Written materials play a key role in the CSO duties. Many documents such as Industrial Health & Safety Regulations, Workers Compensation Regulations, and Materials System Data Sheets require the ability locate information, to interpret regulations, and to apply them in the current setting. Another source of information is equipment manuals. While memory is helpful, but ability to find and interpret information is key. In addition most reading occurs in conjunction to safety issues.

This Foreman sends and receives fax messages regularly. Memos and safety tour reports are done daily. He is also required to take notes at meetings. At one time he filed a daily work report.

Although math functions are not readily needed for the CSO they are done on an automatic basis for the other parts of the job. Math requirements include: measuring, adding,subtracting, using decimals, fractions. In addition calculating volumes of unusual geometric shapes is necessary.

Blueprint reading is essential. Project specification documents also provide finishing details.

He uses drawings to help others visualize what is required for a specific task.

Planning is usually 2 to 3 days in advance, although a week would be preferred. He also deals with crisis management and trouble shooting. Decisions are based on prior experience. Organizational skills are key in coordinating trades. Timing is tied to keeping on schedule. Arranging crane times requires organization.

Apprenticeship and probably a minimum of six years of experience as a journeyman are required for this job. Grade 10 is required to enter into the apprentieship but grade 12 is preferred. The CSO training consists of an intensive two week course.

Contact is made on a daily basis with superintendents. Safety aspects of the job require contact with workers, Foremen, and subtrades. He has occasional contact with suppliers. Most contact is in person or by radio.

Negotiation occurs in interpretation of what would be acceptable as a safety infraction, although the position carries the authority to "shut them down" (stop work in progress until a safety issue is resolved).

He spends one half hour a day in the office, seven hours on site. While site conditions on this job are sheltered, any heating that is done is done to keep the concrete warm and not for the comfort of the worker.

THE JOB SKILLS EDUCATION PROGRAM

The Job Skills Education Program (JSEP) was developed by Florida State University to improve academic competencies of the United States military. Many individuals lack sufficient knowledge and skills to undertake their military occupational specialties.

The army took on the monumental task of analyzing nearly 100 of their most common jobs to determine the prerequisite competencies needed for each. The results were the basis for the JSEP design. Through lessons and series of lessons, instruction focuses on specific academic competencies needed to successfully undertake specific occupations.

Because of these positive results and the general comparability of many military occupations to civilian counterparts, it was determined that JSEP could well be used in a civilian setting to assist underskilled individuals to improve and be better prepared for employment or subsequent education and training.

Recently the Executive Director and Skills Analyst of *SkillPlan* viewed a small portion of the 400 hours of individualized instruction available on computers.

Of particular interest is the learning prescription for a Carpenter. A list of 108 learning competencies is required for this occupation. Each listing represents a set of sequential lessons appropriate to the learning goal.

APPLICATION TO CARPENTRY LITERACY TASK ANALYSIS (LTA)

The Carpenter and three of the Carpenter Foremen interviewed were asked which learning components were applicable to their job and were asked to indicate which areas in particular were important in the performance of the job.

FINDINGS:

CARPENTER:
Of 108 learning functions listed, the Carpenter selected 93 as being components of his job. Several items not selected were seen as part of the Foreman's job.

Emphasis was placed on:
Geometry functions
Locating information (eg Building Codes)
Using jargon and trades terminology
Identifying spatial orientation terms with positions (layouts)
All measurement functions

Limited use:
Writing skills including spelling, capitalization, punctuation and grammar.
Solving simple algebraic equations

JUNIOR CARPENTER FOREMAN
This worker added 8 competencies not included by the Carpenter

Emphasis was placed on:
Using word problems (eg Specifications)
Deriving Equivalent algebraic equations
Using codes to perform a task (eg Blueprints)

Limited use:
Applying writing skills

CSO FOREMAN
The Foreman, acting as Construction Safety Officer emphasized that additional competencies were needed for him to perform his job.

Emphasis was placed on:
Reading for information
Interpreting for decision making (eg regulations)
Report writing
Handwriting

Limited Use:
Numeracy skills were limited in his function of CSO

SENIOR CARPENTER FOREMAN
Having conducted the first two tests of the JSEP prescription for verification, questions to this worker were of a general nature. He indicated more need to use writing skills than the starting Foreman but they were not a large part of his job.

Only one item of 108 was not selected by any worker.

CONCLUSIONS:

1. This exercise provides evidence that the JSEP prescription is accurate.

2. The components give a clear overview of the jobs studied.

   There seems to be a flow of job functions with more reading and writing skills required by the senior Foreman. Observations indicated that the senior Foreman has a need for high level decision making skills. The Construction Safety Officer requires a high level of reading and writing skills.

	CARPENTER CHOICES	F	FOREMAN ADDITIONS

F	Match numbers with word names and models
	Write numbers in sequence
	Order numbers in a specific sequence
	Identify the greatest or least number from a set of #s
	Write or state the place value of a particular digit in a whole or decimal number
	Rounding numbers
	Count forward or backward by a given number & determine the next number in a series
	Intrepret the markings on linear scales
	Identify units of measure & classify according to type of measure
	Measure lengths & distances using rulers, yardsticks or metersticks
	Identify measures of weight, pressure and torque
	Estimate lengths and distances
	Identify degrees & mils as units in determining angular measurement or temperature
	Estimate the measure of an angle not greater than 180 degrees
	Interpret 24-hour time
	Estimate time in seconds and minutes
	Read and interpret gauges
	Using gauges with digital readouts
	Read & interpret scales w/positive & negative markings
	Identify directions that tools, hardware, or components may be moved
	Align parts and equipment
	Intepret spatial relations
	Relate symbols to what they represent
	Identify points, lines, line segments, and rays
	Identify parallel, intersecting, and other lines
	Identify perpendicular and intersecting lines
	Superimpose lines
	Draw lines
	Identify geometric shapes
	Identify characteristics of plane shapes
	Use descriptions to identify objects
	Match figures of both actual size and model drawings
	Identify objects based on position
	Identify angles

	Identify type of angles
	Identify types of triangles
	Draw bisectors of angles & altitudes of triangles
	Label angles
F	Recognize solid shapes & match solid figure shapes to their names
	Identify shape & position terms
	Identify spatial orientation terms w/positions
	Add & subtract whole numbers w/o carrying or borrowing
	Add & subtract whole numbers with carrying or borrowing
	Add & subtract decimals
	Add & subtract measurements
	Estimate a sum or difference
	Multiply and divide whole numbers
	Multiple and divide decimal numbers
	Divide numbers with decimals
	Estimate a product or quotient
	Estimate fractional length, area, volume & distance
	Reduce fractions to lowest terms
	Use a conversion table to convert decimals & fractions
	Convert decimals, percents, and fractions
	Add and subtract fractions
	Multiply and divide fractions
	Estimate fractional parts using common fractions
	Draw plane geometric figures
	Match geometric figures with their word names
	Identify parts of geometric figures
	Compute area and perimeter of a rectangle
	Compute the area and circumference of a circle
	Compute the area and volume of rectangular solids
	Use formulas to solve problems involving geometric figures
F	Compute averages
	Solve problems combining all processess using whole numbers, mixed numbers & fractions
	Solve problems using units of measurement

	Get info from number lines, graphs, tables, and scales
	Solve conversion problems
	Solve problems involving ratio and proportion
F	Use word problems
	Solve simple algebraic equations
F	Derive equivalent algebraic equations
	Calculate with a pocket calculator
	Follow directions to complete a task activity
	Select text and visual materials
	Follow directions
	Situational decision making
	Procedure directions
	Recognize meanings of common task-related words
F	Identify the meaning of a word from context
	Identify meanings of contractions, abbreviations, and acronyms
	Determine the meaning of figurative language
F	Locate and file information alphabetically
	Locate into from a table of contents, index, appendix, and glossary
	Skim or scan for relevant information
	Locate information to perform a task using cross reference
	Find information in two-column tables
	Find information in tables with columns and rows
	Read illustrations
	Use a key, legend or parts list
	Use a sequence of illustrations to follow a procedure
	Integrate visual info to select a course of action
	Use block, wiring, and schematic diagrams
	Find parts on a form
F	Fill in numbers on a form
F	Fill in information on a form
F	Record essential information
F	Spell frequently used words correctly
F	Identify words that need to be capitalized
F	Apply punctuation rules

	Apply common rules of grammar
	Identify similarities & differences between & among objects
	Identify defects or damage to equipment
	Move, align and connect objects
	Identify objects by their characteristics
	Use your senses to determine a course of action
F	Use codes to perform a task

JOB LEARNING ANALYSIS METHOD

The Job Learning Analysis Method described in Pearn and Kandola (Great Britain, 1988) was applied to the job of Carpenter and Carpenter Foreman. This method describes jobs in terms of learning skills which contribute to the satisfactory performance of the job. A learning skill is defined as one that is used to increase other skills or knowledge. For instance, memorization skills lead to the more successful application of other skills which rely upon having knowledge readily available and "in one's head".

The learning skills represent broad categories of job behaviour which need to be learnt. These skills include:

1. Physical skills, i.e. - activities that require practice and repetition in order to get right, become fast enough, or minimize errors. They do not include activities which are simple procedures and can be performed easily from written or oral instructions. In the construction context, these skills will include strength and agility of movement.

2. Complex procedures, sequences of activity or procedures which are: (a) remembered, memorized or (b) followed with the aid of written material or other aids.

3. Checking, assessing, discriminating -i.e.- non-verbal information which is received by jobholders through their senses (sight, sound, smell, taste, touch) and which is used to make judgements or take some other action, and which usually takes practice to get right.

4. Memorizing facts, information - i.e. - (a) information that has to be retained in one's head and recalled for brief periods of time, or (b) information that has to be learnt, retained and recalled for a period greater than one day.

5. Ordering, prioritizing, planning, i.e. - the extent to which the jobholder has any responsibility for, and flexibility in, determining the way a particular job activity is performed.

6. Looking ahead, anticipating, i.e. - the jobholder can foresee problems and take some action which might prevent or at least reduce the effects of a problem or fault as well as meeting needs in advance.

7. Diagnosing, analyzing, solving, i.e.- the extent to which the jobholder sorts out problems (a) without assistance, or (b) with assistance such as manuals, other people.

8. Interpreting or using written, pictorial, diagrammatic material, i.e.- the extent to which written materials, manuals and other sources of information (diagrams, charts) need to be used and/or consulted in order to learn the job.

9. Adapting to new ideas,systems, i.e. - the extent to which the jobholder is required to adapt or to learn new ideas, equipment, methods by using manuals or other written materials, or using other sources of information. (Pearn and Kandola, 1988, pp. 45 - 46)

In the second set of interviews, which took place after the observation, the Carpenter and the three Foremen were asked to think of the main duties of their jobs in terms of the nine learning categories. The conversation which followed led to some interesting insights about the job, since the format led to the workers thinking about their job in a more analytical way than in the first interview which had been more descriptive in nature. It is important to point out, however, that in some cases the workers had trouble coming to grips with the vagueness of the categories. Nevertheless, this part of the analysis was useful in getting workers to reflect on their job in ways which would not have emerged with a less probing methodology.

THE CARPENTER

The Carpenter listed five major functions or activities, as can be seen in the completed JOB-LEARNING ANALYSIS SCORING GRID.

These five major functions are:

- Construct Stairwells
- Set and strip bulkheads
- Fly the tables (moving forms for concrete to higher floor)
- Set columns in place
- Prepare deck for core slab

Category 1 - Physical skills

Physical skills are used in all five major functions, but are particularly called for in **preparing the deck for the core slab**. This is heavy work.

Category 2 - Complex Procedures

Complex procedures are followed in **constructing stairwells,** and **setting and stripping bulkheads**. Procedures and dimensions are remembered and kept "in the head". Written aids are not used.

Category 3 - Checking, Assessing, Discriminating

This skill of using the senses to make judgements is used mostly in **setting and stripping bulkheads**. *("You just know that a dimension should be 4 1/4 inches and you can tell by looking at it.")*

Category 4 - Memorizing Facts and Information

Long term memory comes into play in **setting and stripping bulkheads**.

Category 5 - Ordering, Prioritizing, Planning

No functions were selected for this category. This may because this skill area more properly rests with the Foreman.

Category 6 - Looking Ahead, Anticipating

This is particularly important when **flying the tables**. At that time there are so many aspects to be coordinated that there is danger of something going wrong. Looking ahead to a potential problem, like a misplaced ladder or wood pieces not properly tied on, can avert a later mishap.

Category 7 - Diagnosing, Analyzing, Solving

This is done mainly in regard to **constructing stairwells, setting and stripping bulkheads** and **flying the tables**. This is generally done by oneself, without assistance.

Category 8 - Interpreting or Using Written/Pictorial/Diagrammatic Material

This is done mainly when **setting the bulkheads**. The dimensions are shown on prints.

Category 9 - Adapting to New Ideas and Systems

Being able to adapt as necessary is a central aspect of the Carpenter job and this flexibility is required in respect to all major functions of the job.

Looking at job functions in this way helps us to reach a better understanding of how the Carpenter perceives the complexities of his own job. We can see from the completed grid, for instance, that it is only in **flying the tables** that looking ahead and anticipating problems is central. This accords with our knowledge that this job is among the most potentially dangerous on the job site.

We can see as well by examining the grid that **setting and stripping bulkheads** calls for the use of the most skill areas (7 of the 9), with **constructing stairwells** coming next, highlighting 4 of the categories. This is the kind of information which will be useful to a trainer in determining a focus for basic skills development.

We will now see how the various categories apply to the jobs of the three Foremen interviewed.

JUNIOR CARPENTER FOREMAN

We will now look at the Learning Categories as they apply to the junior Carpenter Foreman.

The junior Carpenter Foreman listed five major functions.

- organizing (lifting legs) for fly forms
- scheduling
- organizing crane time
- renovation of forms
- stripping forms

Category 1 - Physical Skills

Physical skills were highlighted in **organizing for fly forms**.

Category 2 - Complex Procedures

Two of the five functions require the use of complex procedures. These are **organizing for fly forms** and **stripping forms**.

Category 3 - Checking, Assessing, Discriminating

This Foreman referred to the capacity to visualize a function when the information is not actually there. He found this particularly relevant in **scheduling** and in **renovation of forms**.

Category 4 - Memorizing Facts, Information

Memorizing facts and information is important for **organizing for fly forms, scheduling,** and **stripping forms**.

Category 5 - Ordering, Prioritizing, Planning

This skill area was chosen for three of the five major functions - **organizing for fly forms, scheduling** and **organizing crane time**.

Category 6 - Looking Ahead, Anticipating

This Foreman (like the senior Foreman and the Carpenter) saw his function in regard to **fly forms** as requiring looking ahead for potential problems and averting the problem before it occurs. This anticipatory quality is also necessary when **organizing crane time**, since often there are conflicting demands and urgencies in accessing the time of the crane operator.

Category 7 - Diagnosing, Analyzing, Solving

The Junior Carpenter Foreman saw this set of skills as applying to every major function of his job. This is consistent with the Senior Carpenter Foreman who also saw this category as applying to every major function of his job. Obviously, this is an area of key importance for a Foreman.

Category 8 - Interpreting, Using Written/Pictorial/Diagrammatic Material

Organizing for flying forms and **renovating forms** calls for the use of prints.

Category 9 - Adapting to New Ideas and Systems

This relates to all functions, but particularly to the **renovation and stripping of forms**. Renovation of forms is not always done in conformity to prints. *"We make other stuff work."* It appears, from comparing the responses of these two Foremen that the senior Foreman is more active in the area of "ordering, prioritizing and planning" than the junior Foreman and also in "looking ahead and anticipating". Whether this is as a result of the differing nature of their work or differing individual work styles is not immediately clear.

Both see their roles in regard to fly forms as using the greatest number of skills.

THE SENIOR CARPENTER FOREMAN

The Senior Carpenter Foreman listed 6 major functions;

- Getting materials on site
- Organizing crews
- Scheduling
- Placing Fly Forms
- Bringing up Core (Elevator)
- Custom Make Free Forms

Category 1 - Physical Skills

Physical skills for this Foreman are most in use when **placing fly forms, bringing up the core,** and **custom making free forms.**
However, for the most part, the Foreman job, by its very nature, is not intensive in physical skills. "Functions are not physical unless I want them to be."

Category 2 - Complex Procedures

This Foreman highlighted four of his six major functions as requiring the use of complex procedures. These are **organizing crews, placing fly forms, bringing up the core,** and **custom making free forms**.

Category 3 - Checking, Assessing, Discriminating

This category refers to the types of non-verbal information received through the senses. Visual acuity is part of this. This skill area applies particularly to **placing fly forms**. The ability to visually assess and discriminate is an essential element of this Foreman's job.

Example: *"Curtain wall is embedded steel welded on the side of a building. I can tell if it's right by looking at it."*

Category 4 - Memorizing Facts, Information

This skill is most utilized in **bringing up the core**. Memorizing is not a large part of the job, however, since it is the Carpenters rather than the Foreman who must do most of the remembering, especially in relation to getting materials on site. Memory is used to effect small changes, but the blueprints are referred to for larger changes. *"All we are are information gatherers - I pass the information on. If I forget I'll ask the guy I gave the information to."* Short term memory is more relevant to this Foreman than long term memory.

Category 5 - Ordering, Prioritizing, Planning

This category, which was not chosen by the Carpenter, was chosen by the Foreman for every major function. It is central to the nature of being a Foreman, and is done in conjunction with other Foreman so that the decisions can respect the larger spectrum of need.

Category 6 - Looking Ahead, Anticipating

Problems are anticipated and avoided by "getting the right people on the job". This may be accomplished at times by "calling up favours from other crews". It can also be accomplished by locating and utilizing the skills of people with complementary skills to one's own rather than a mirror image of one's own skills. *"If I have a short term memory, I don't want people with short term memory around me."*

Anticipating and looking ahead is important in regard to all major functions of the job.

Category 7 - Diagnosing, Analyzing, Solving

The area of "problem solving", and analyzing what approaches to take is very important for the Foreman - not so much in his own actions but in encouraging subordinates to learn and to think things through.

> *"I encourage them (carpenters) to do problem solving on the job. I give them the opportunity by saying "How would **YOU** do it? Usually they do it in the same way that I would. If not, I offer my suggestions. If they're way out, I substitute my way."*

This approach to encouraging, teaching and mentoring problem solving is important in respect to every major duty of the Foreman's job.

Category 8 - Interpreting Using Written/Pictorial/Diagrammatic Material

This is particularly relevant when **placing fly forms, bringing up the core** and **custom making free forms.** The skill at reading blueprints is essential. This can be improved greatly through use and repetition. It is helpful if blueprints are seen in a real life context "so that you can look at it on the drawing and then look at it on the building. It is hard to look at a drawing and know what it will look like." Communicating this information to the subordinates in a way which can be well understood is a key role of the Foreman.

Category 9 - Adapting to New Ideas, Systems

Being able to adapt to new ideas, and changes in systems is particularly germane to **placing fly forms, bringing up the core** and **custom making free forms**.

What have we learned about the Senior Carpenter Foreman's role through the application of the grid?

We find that the skill of "ordering, prioritizing and planning - the skill NOT chosen by the Carpenter - is at the very centre of the Carpenter Foreman job. We find as well that the Carpenter Foreman must be adept in drawing out the qualities of the Carpenters. Rather than telling them "how" to do something he encourages their independent judgement and only substitutes his own when the worker is clearly off track. This teaching aspect is really central to the job, and in a sense builds upon the teaching role at a more basic level that the journeyman Carpenter has with the apprentice. The whole area of blueprint reading also looms large in the Foreman role - and the need to make something which is abstract and linear (a blueprint) into something that is concrete and dimensional (a drawing).

The "getting the right person" for the job and the seeking of complementary skills to one's own requires self-understanding as well as understanding of others. Insight into human nature, linked with knowledge of learning styles and individual differences would seem to be important for the Foreman.

THE CARPENTER FOREMAN/CS0

The Foreman who is concurrently fulfilling the role of CSO listed eight major functions - three relating to the Foreman function and five to the CSO duties.

The Foreman function was referred to as "Management" and involves "finishing off the building". The three main functions are:

- putting up manhoist
- organizing hardware and finishing
- installing plastic windows

The main functions relating to the CSO part of the responsibilities are:

- promoting safety awareness
- obtaining knowledge base
- conducting daily CSO site tour
- preparing reports and recommendations
- doing followup (enforcement and compliance)

When conducting this part of the analysis, the analysts confined their inquiry to the CSO section of the job.

Category 1 - Physical Skills

Physical skill is required only for the daily site tour which calls for agility rather than strength. A health certificate of fitness is required to be a CSO. It takes fitness to enter confined spaces, check out sewer lines and the like.

Category 2 - Complex procedures

This category refers to sequences of activity or procedures which are remembered or memorized or followed with the aid of written materials. This category was chosen for none of the CSO job functions. No memorization is required.

Category 3 - Checking, assessing, discriminating

This is particularly important on the site tour. The CSO is required to make judgements through the senses. There is checking to make sure there are guard rails and proper fall protection.

Category 4 - Memorizing Facts and Information

This is generally required in the follow-up and compliance function. It is necessary to remember what actions were called for so that one can assess the degree to which appropriate remedial action has been taken.

Category 5 - Ordering, Prioritizing, Planning

This category was not chosen for any of the functions. *"It's usually after the fact that you run into a problem - you may plan for it but it doesn't go that way."* The CSO has little flexibility in determining the way a particular job activity is performed since he is not a WCB enforcer.

Category 6 - Looking ahead, Anticipating

This happens on the site tour when you look at preventative actions - such as the necessity to keep concrete chips and debris away from stair areas to prevent falls.

Category 7 - Diagnosing, Analyzing, Solving

Sorting out problems, either with or without assistance, happens particularly on the site tour but can happen at any time throughout the day.

Category 8 - Interpreting and Using Written/Pictorial/Diagrammatic Material

This is done in the function of promotion of safety awareness and the preparation and/or dissemination of safety information, and in the follow up stage of seeking compliance.

Category 9 - Adapting to New Ideas and Systems

Learning about new ideas and particularly learning about new equipment is vital to the CSO. This information is then used in **promotion of safety awareness** and in **the daily site tour.**

Comment

The Foreman/CSO said that there is a major increase in reading when CSO functions are added to the regular Foreman functions. The CSO reads a great deal of material from the WCB. This is important since the CSO must interpret "grey areas" for decision makers, and that interpretation rests on knowledge of facts and information from a variety of sources. Assimilation of information and making connections between seemingly unrelated documents is thus essential for the CSO.

The CSO should be able to write clearly and with precision, based on knowledge. The CSO needs to know a great deal about jobs outside his own area of work. For instance, a Carpenter CSO also has to know what a Labourer has to know about safety -e.g. - safe use of scaffold. Does the Labourer know the maximum height of the scaffold prior to the tie off? (3 times minimum base). Part of the CSO function is to review this kind of information with the Labourer, and to point out careless ladder work and the safety procedures which could correct potential dangers in the use of ladders.

SIMILARITIES AND DIFFERENCES IN THE FOREMENS' SKILLS

According to the information obtained through the Grid, the Senior Carpenter Foreman is more active than the Junior Carpenter Foreman in the areas of "Ordering, Prioritizing and Planning" and "Looking Ahead, Anticipating." These areas do not stand out for the Foreman/CSO who, rather, is more active with "Interpreting and Using Written, Pictorial and Diagrammatic Material" and "Adapting to New Systems.

The Foreman/CSO has a much greater amount of reading and writing to do than either the Junior or the Senior Carpenter, Foreman and must assimilate information from many different sources . However, he appears to have less onerous duties in regard to organizing and directing personnel.

It is interesting to note the ways in which personality and behavioural factors shape the ways in which the various Foreman jobs are done. Both the junior and the senior Carpenter need to

exhibit leadership while at the same time offering encouragment and building teamwork. It is more important that the Foreman/CSO have a more authoritative style based on compliance with rules and regulations. Management should keep this factor in mind when assessing what workers may be most suitable for the various types of Foreman responsibility.

Here are some of the INCREMENTAL SKILLS which are required to move from Carpenter to Carpenter Foreman.

1. Blueprint reading and drawings
2. Reading from specifications (varies from job to job)
3. Ability to fill in forms, take short notes, write brief memos
4. Understanding of unit cost (when are we making money) *
5. Organizing time (foremen wear watches)

* This function is more essential when moving from a Foreman to a superintendent than when moving from a Carpenter to a Foreman, but it is an asset when acquired at the Foreman level.

THE JOB-LEARNING ANALYSIS SCORING GRID

	LEARNING CATEGORIES CARPENTER	A	B	C	D	E
1.	Physical Skills					
2.	Complex Procedures					
3.	Checking\ Assessing\ Discriminating					
4.	Memorizing Facts\ Information					
5.	Ordering\ Prioritizing\ Planning					
6.	Looking ahead\ Anticipating					
7.	Diagnostic Analysis\ Solving					
8.	Interpreting Using Written\ Pictorial \ Diagrammatic Material					
9.	Adapting to New Ideas\ Systems					

MAIN ACTIVITIES CARPENTER	
A	Construct stairwells
B	Set and strip bulkheads
C	Fly Tables
D	Set columns in place
E	Prepare deck for core slab

The Job-Learning Analysis Scoring Grid

Source: Pearn, M. and Kandola, R. (1988). Job Analysis - A Practical Guide for Managers. Institute of Personal Management. Wimbledon, London. p. 49.

THE JOB-LEARNING ANALYSES SCORING GRID

LEARNING CATEGORIES JUNIOR CARPENTER FORMAN		A	B	C	D	E
1.	Physical Skills	■				
2.	Complex Procedures	■				■
3.	Checking\ Assessing\ Discriminating		■		■	
4.	Memorizing Facts\ Information	■	■			■
5.	Ordering\ Prioritizing\ Planning	■	■	■		
6.	Looking ahead\ Anticipating	■		■		
7.	Diagnostic Analysis\ Solving	■	■	■	■	■
8.	Interpreting Using Written\ Pictorial \ Diagrammatic Material	■			■	
9.	Adapting to New Ideas\ Systems				■	■

MAIN ACTIVITIES JUNIOR CARPENTER FOREMAN	
A	Organizing for fly forms
B	Scheduling
C	Organizing crane time
D	Renovation of forms
E	Stripping forms

The Job-Learning Analysis Scoring Grid

Source: Pearn, M. and Kandola, R. (1988). Job Analysis - A Practical Guide for Managers. Institute of Personal Management. Wimbledon, London, P.49.

THE JOB-LEARNING ANALYSES SCORING GRID

LEARNING CATEGORIES SENIOR CARPENTER FOREMAN		A	B	C	D	E	F
1.	Physical Skills						
2.	Complex Procedures						
3.	Checking\ Assessing\ Discriminating						
4.	Memorizing Facts\ Information						
5.	Ordering\ Prioritizing\ Planning						
6.	Looking ahead\ Anticipating						
7.	Diagnostic Analysis\ Solving						
8.	Interpreting Using Written\ Pictorial \ Diagrammatic Material						
9.	Adapting to New Ideas\ Systems						

MAIN ACTIVITIES SENIOR CARPENTER FOREMAN	
A	Get materials on site
B	Organize crews
C	Schedule
D	Place fly forms
E	Bring up (elevator) core
F	Custom make fly forms

The Job-Learning Analysis Scoring Grid

Source: Pearn, M. and Kandola, R. (1988). Job Analysis - A Practical Guide for Managers. Institute of Personal Management. Wimbledon, London, P.49.

THE JOB-LEARNING ANALYSES SCORING GRID

LEARNING CATEGORIES FOREMAN\CSO		A	B	C
1.	Physical Skills		■	
2.	Complex Procedures			
3.	Checking\ Assessing\ Discriminating		■	
4.	Memorizing Facts\ Information			■
5.	Ordering\ Prioritizing\ Planning			
6.	Looking ahead\ Anticipating		■	
7.	Diagnostic Analysis\ Solving		■	
8.	Interpreting Using Written\ Pictorial \ Diagrammatic Material	■		■
9.	Adapting to New Ideas\ Systems	■	■	

MAIN ACTIVITIES FOREMAN\ CSO	
A	Promoting safety awareness (obtaining knowledge base)
B	Daily CSO site tour (reports and rcommendations)
C	Follow-up (enforcement and compliance)

The Job-Learning Analysis Scoring Grid

Source: Pearn, M. and Kandola, R. (1988). Job Analysis - A Practical Guide for Managers. Institute of Personal Management. Wimbledon, London, P.49.

RECOMMENDATIONS FOR TRAINING

1. LEARNING CULTURE

There is an "attitude" that makes workers successful in their jobs. An attribute common to all workers interviewed was that they knew something wider than what the job required. They either had a variety of past experience, perhaps being in business for themselves, had learned through training or had an interest to pursue new knowledge. Several mentioned having a quantity of books for reference at home or studying the plans at night. These workers had, in effect, immersed themselves in learning culture without the active intervention of the company. The fact that extra job related learning led to significant advancement on the job suggests that a stronger company role in training will lead to larger pool of readily identifiable promotable individuals.

The move from Carpenter to Foreman requires an expansion of vision. The Carpenter works closely with his partner or crew. The Foreman has to interface with sub trades that have needs and concerns not particularly in the Foreman's background. For effective teamwork, there needs to be some understanding of the work of others on the job site.

Health and Safety issues involve skills needed across positions and trades. For example, the perception is that although all workers say that they understand hand signals, many do not. This could cause difficulty in a sudden crisis if confusing hand signals were used.

There is a **LEARNING CULTURE** when:	No learning culture when:
All workers are encouraged to learn a variety of skills.	Workers are told "You don't need that. Only the Foreman needs that."
Company and union encourage training.	Company/union do not actively promote training.
Management offers incentives to workers who access training opportunities - e.g. shared time and cost, prizes for active participation in training.	No incentives are offered and workers are told, "It's strictly on your own time and cost."
Training is subtle - a variety of training takes place on site as a regular part of work.	Training takes place only in a formal context.

RECOMMENDATION

Encourage expansion of skill base.

The policy of " more is better" should be adopted. Either formally or informally Foremen from different trades might share their parts of the blueprints. It may be useful to identify what aspects of their jobs might make it difficult to coordinate timing. Perhaps there could be an opportunity to shadow the others job or to mix crew members. In some way, Carpenters need to have an understanding of an ever increasing number of job functions in order to move to Foreman. Foreman must understand the parameters of trades in order to contribute to a team approach and develop organizational skills.

Record all training completed.

The union can provide an important function by accurately recording qualifications such as WHMIS, TQ, etc. Recording and acknowledgement of upgrading will infer value.

Monitor safety knowledge.

All workers should participate in a review of their ability to correctly use hand signals and basic safety.

2. READING SKILLS

Blueprint Reading:

Carpenters may have an interest in reading site blueprints, however, they could adequately perform their job without doing so. The junior Foreman is constantly referring to the blueprints and is required to consult more than one set and to integrate information. The senior Foreman appears to have additional responsibility in being the lead in the construction of new areas. He often has to read sets of blueprints and anticipate potential problems or identify possible errors in design.

Reading from other sources:

The Carpenter has limited need for reading, but the Foreman positions can require varying amounts. Some Foremen could perform their job without much reading, although with the advent of the fax machine and the computer it is likely that more documentation will be the norm. A significant skill gap occurs between a Carpenter and Foreman when the Foreman is required to read specifications or is required to assume CSO duties. Both need sophisticated reading skills to locate information of a technical nature, to interpret, and to assimilate the information with other data. There is a need to locate the required information quickly.

For example: - The CSO reads MSDS, bylaws, regulations
- The Foreman reads specifications and assimilates the information with information from the blueprints

RECOMMENDATION

Upgrade blueprint skills.

It appears essential that Carpenters become familiar with blueprints. For those who wish to expand their present knowledge of blueprints, there may be a need to put on an off-site course possibly with management paying for some class time.

The most useful blueprint reading is that related to the actual task at hand. There is a sense of ownership and pride in understanding one's own part in the whole. The Foreman could hold a formal session for a half an hour once a week as a routine to go over the blueprints, showing what has been accomplished and what is yet to do. This will provide an opportunity for the Foreman to familiarize the Carpenters with the various symbols of blueprints which may present difficulties for persons who have limited exposure to them. If an informal approach is more appropriate, each Carpenter could be shown on a regular basis "where he is in relation to the blueprint".

Upgrade reading skills.

Carpenters should be exposed to regular reading upgrading opportunities, especially in reading for technical information.

3. MATH SKILLS

The Carpenter must be able to function competently and comfortably with a range of math skills. (See JSEP)

The Foreman could encourage individuals to upgrade or teach the Carpenter himself as opportunities arise. The community offers many possibilities, although courses tend to be more formal in nature. Computer assisted programs such as JSEP are available for individualized upgrading. While start up cost is high, a computer system has the advantage of being on site, geared to individuals goals and levels, can be used in small segments and offers privacy for the learner.

RECOMMENDATION

Upgrade math

Carpenters should be exposed to regular math upgrading opportunities.

4. MATH APPLIED TO COSTING

A Carpenter is aware that wise use of materials is cost effective. It is assumed that a cut would be made at the end of a board not in the center. In the Foreman's position there is recognition that performance is measured through a costing procedure. The Foreman fills out time sheets with an accompanying code that indicates a costing category. The junior Foreman has an awareness that if forms can be stripped more quickly with fewer people , a cost saving occurs. As the Foreman has more responsibility there seems to be more of an awareness of cost units. It becomes more than just getting the job done; success is measured in $.

Taking the example of wasting lumber, Carpenters could work out costing for lumber supplies as a team. Not only would this increase awareness of cost saving practices. It also is an opportunity to practice math skills.

The sophistication of costing awareness will increase with increasing responsibility. Math aptitude is high, therefore it is realistic that Foremen will grasp the underlying principals of cost accounting. An understanding of Why am I reporting the information in a particular way ? What happens next? Did I make my costing target? Which areas lost money? What were contributing factors? Of particular value will be the figures relating to the worker's area of responsibility.

RECOMMENDATION

Link job performance to cost accounting principles.

It is important that Carpenters have a understanding of how their input on the job affects the economic success of their team.

Company policy will dictate privileged information; however an overview of costing procedure prepares Carpenters and Foremen for a further increases in responsibility.

5. INSTRUCTING MODEL

There is a great deal of instruction, training and learning by watching that goes on during the work day. The Carpenter shows the apprentice, the Foreman shows the Carpenter, and the superintendent shows the Foreman. From observing two very competent Foreman and a Carpenter, it was clear that their instructing style was very effective. All three mentioned making sketches; sometimes these were an interpretation from the blueprint. In some instances, they demonstrated how the work was to be done. This instructing function seems to be a key vehicle in passing on skills.

RECOMMENDATION

Capitalize on instruction.

That the role of "mentor/coach" be recognized and that the accompanying skills be developed. An informal approach may be to have Foremen share ways of teaching . As a part of a Foreman training course, an understanding of learning styles, ideas for making instruction clearer, and refining detail drawing skills would be helpful.

6. **Training On-Site**

Training is available to workers in a number of different ways. The "journey" from apprentice to journeyman offers a variety of structured training requirements. Once an individual becomes a journeyman the rate of training often slows down considerably. Most trades offer journeyman upgrading through the training plans and there are a variety of courses at BCIT and the colleges which may be of interest to tradespersons. Barriers of time, energy and cost, however, often deter workers from gaining access to opportunities which are available to them. In addition, workers often avoid training if they feel it will not be relevant to their individual needs.

A company with a fully developed training culture is conscious of its ability to influence job performance and employee motivation through the provision of on-site training opportunities. In order to be most effective these opportunities should be structured in short "bites". There are many advantages to offering the "short bites" approach. It is easier to arrange and prepare. Trainees are less likely to be intimidated by the prospect of attending, and no one's timetable is excessively onerous. In addition, this approach allows the company to provide information and training on a number of different subject areas - to whet the appetite for further studies. It is also an avenue for employer recognition of employees through certificates of achievement/completion.

RECOMMENDATION

Conduct on-site training

Efforts should be made fore companies to offer some short training "bites" on-site. This could be partly on company time and partly on worker time. The "understanding our own blueprints" session would be ideal in this context.

7. **Communications**

The interaction between Foremen and superintendents takes different forms. In general, it appears that supervision is reasonably relaxed, with the Foremen and superintendents having regular but short daily meetings to discuss priorities and schedules. The mail box cubbyhole which each Foreman has in the Site Trailer is an additional means of communication. In addition, superintendents generally tour the site once a day at least, and more if difficulties have surfaced.

In spite of these points of liaison, Foremen often do not have the chance to interface with the superintendents on more than a surface level. Foremen (especially those who may aspire to be a superintendent) may have questions about costing and specifications, but they are hesitant to ask about them for fear of intruding on the superintendents' busy schedules. Often, therefore, the mentoring which could take place from superintendent to Foreman does not take place.

RECOMMENDATION

Increase communications between Superintendent & Foremen

Superintendents could consider setting aside a "training accessibility" hour at regular intervals to encourage Foremen to come in with questions re costing, specifications, etc. Perhaps a monthly "brainstorming" session in which superintendents and Foremen participated could also result in a more detailed and constructive dialogue between superintendents and Foremen.

8. PROBLEM SOLVING

To varying degrees, those interviewed enjoyed an atmosphere of having minimal supervision. They were autonomous in their positions. In each case, the person to whom they were responsible had set the " what" and " when" instructions and had allowed the "how" up to the worker. All said that if things went wrong the supervisor would spend more time on site. It is likely that not all Foremen use this style, in fact, it is possible that some Carpenters get very little problem solving experience.

In a Foreman's course, management style should include ways of supporting workers to find their own solutions. It is probable that the Foreman will model a style that he learned as a Carpenter. The style of teaching should allow Foremen to "brainstorm" solutions and role play dealing with difficulties.

RECOMMENDATION

Encourage a problem solving management style.

Provide opportunities for each of the players to problem solve in their respective positions building experience in decision making.

Developing this approach to supervision has the secondary effect of building responsibility, trust and self-esteem.

9. DEVELOPING JUDGEMENT

The Carpenter's work is largely physical while the Foreman's job involves watching, checking and making judgement calls.

The senior Foreman demonstrated highly developed skills in predicting, anticipating and discrimination. While on the surface these may not be seen as teachable qualities, providing opportunities on all levels to practise and gain experience and confidence will encourage the development of these skills.

RECOMMENDATION

Encourage higher level thinking skills.

Provide as many opportunities as possible to Carpenters to develop these judgement skills.

Guessing and predicting can be built into any curriculum. For example, blueprints with deliberate errors can provide a lesson in "spot the error", "what's missing" etc. Carpenter can be asked to predict how much material will be needed, if something is level, etc.

Secondly, that standards of accuracy be strictly adhered to. Some judgements center around knowing how precise the need for accuracy is and what else will be affected. (This also pertains to knowledge of other trades)

SUMMARY OF RECOMMENDATIONS

1. **Learning Culture**
   Encourage expansion of skill base.

   Record all training completed.

   Monitor safety knowledge.

2. **Reading Skills**
   Upgrade blueprint skills.

   Upgrade reading skills.

3. **Math Skills**
   Upgrade math skills.

4. **Math Applied to Costing**
   Link job performance to cost accounting principles.

5. **Instructing Model**
   Capitalize on instruction.

6. **Training On-site**
   Conduct on-site training.

7. **Communications**
   Increase communication between Superintendent and Foremen.

8. **Problem Solving**
   Encourage a problem solving management style.

9. **Developing Judgement**
   Encourage higher level thinking skills.

CONCLUSION

The Literacy Task Analysis of the Carpenter and several variations of the Carpenter Foreman revealed that there is an identifiable increment of skills as one moves from Carpenter to Carpenter Foreman. The analysis revealed clearly the skills gap between and among the positions studied.

The analysis also revealed, as has been stated in the report, that one of the main edges for promotability occurred because of skills that these workers had acquired outside of the formalized training provided through the union and the company. In other words, experience counted for a great deal - which leads to the observation that "If learning is based on experience, then a part of training should be providing experience." Judging by the types of skills that the workers interviewed had acquired, it would appear that training which covers broad objectives is probably more relevant than that with a narrow focus.

SkillPlan has found this Literacy Task Analysis to be a valuable tool. It points directions toward the types of basic skills upgrading which can be useful in helping workers ascend a career ladder within their trade. It has also raised some philosophical questions about a "learning culture", and how it can be identified, built and enhanced.

The analysis clarified the extremely important nature of team work, decision making, and problem solving - all of which can be addressed in a training perspective. The analysis also showed the extent to which the Carpenter and Carpenter Foremen form part of a chain of teaching, mentoring and helping - a chain which begins with the journeyman Carpenter mentoring the apprentice and continuing with the Foreman mentoring the journeyman Carpenter and the superintendent (to a lesser degree) mentoring the Foreman. The constancy of this "teaching" role suggests that it may be helpful to make all these workers more aware of the variety of techniques which could assist them in this role.

The *SkillPlan* analysts have appreciated the opportunity to see the skills of the Carpenter and Carpenter Foremen in action. The diversity of skills displayed and the competence exhibited in using them was truly impressive and is a credit to PCL management, the training plan and the workers themselves. It was indeed a pleasure to see workers at all levels so obviously happy with the work that they do.

SkillPlan envisages several types of assistance which can be offered in the future. There are a number of resources available on video or in book form which deal with supervisory skills. *SkillPlan* could assemble such information to see how it may be adapted to a construction setting suitable for possible integration into a Foreman's course. *SkillPlan* could contribute to the curriculum design of basic skills enhancement modules which could be added to the other content of a Foreman's course. We expect that our task analysis study of a smaller construction company will assist us in obtaining the type of overview which will make such curriculum design possible.

SkillPlan looks forward to discussing the various recommendations in this report with the company and the union with a view to establishing ways in which *SkillPlan* may contribute to implementation of those recommendations where a *SkillPlan* role may be appropriate.

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Part II

DETERMINING WORKPLACE BASIC SKILLS

A LITERACY TASK ANALYSIS (LTA)

OF

THE CARPENTER APPRENTICE
THE CARPENTER
CARPENTER FOREMAN
AND THE SUPERINTENDENT

This report which is a study of a "small" company should be read in conjunction with an earlier report that studied **The Carpenter and The Carpenter Foremen** in the context of a "large" company.

PART II

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APPENDIX

The Literacy Task Analysis was carried out at Kingston Construction's warehouse project located at 7541 Conway Avenue in Burnaby. This is a Tilt Up construction project, employing Kingston Construction workers in the job categories of Carpenter, Labourer, and Operating Engineer. Subtrades such as Ironworkers, Plumbers and Electricians are also employed on the project.

The analysis was carried out by Glenda Lewe, Skills Analyst seconded to *SkillPlan* through the Building and Construction Trades Department, AFL/CIO Canadian Office, and Lynda Fownes, Research Director, *SkillPlan* during the weeks of June 8 and June 15, 1992.

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GOALS OF THE PROJECT

(a) to validate the basic skills required for the jobs of Carpenter and Carpenter Foreman and to identify the skill gap between the two jobs in order to better target training needs;

(b) to determine the skills of the Carpenter apprentice and examine the ways in which his training is facilitated by other workers on the job site.

(c) to determine the skills of the Superintendent and examine the incremental skills required to move from a Carpenter Foreman position to a Superintendent

(d) to identify similarities and differences between job requirements of tradespersons working for a large construction company and those working for a smaller construction company.

It is important to note that the *SkillPlan* mandate in conducting this study is to gain a greater understanding of the role which basic skills play in supporting trade skills. While Literacy Task Analysis looks at the total context of the job (including trade skills), our focus relates only to the basic skills dimensions which can be addressed through training.

THE PROCESS

Four employees of Kingston Construction were interviewed and observed. These employees occupy the following positions:

- Carpenter Apprentice
- Carpenter
- Carpenter Foreman
- Superintendent

It should be noted that two of these positions were not examined in the PCL Study - the Carpenter Apprentice and the Superintendent. A profile of these two positions is therefore included here. For a Profile of the Carpenter and Carpenter Foreman, please refer to the earlier study of PCL.

As in the PCL study, the methodology of the Literacy Task Analysis at Kingston Construction consisted of two interviews with the four chosen employees and an observation phase. The first set of interviews focused on each employee describing his job, aided by the Questions of the Structured Job Analysis Interview. (See Appendix 1.) Each interview took approximately an hour.

The observation took place on a subsequent day and involved watching the employees carry out a variety of functions, including concrete pouring and placing, stripping of forms, placing embedded metals, and conducting survey activities.

The Superintendent was observed within the context of his supervisory and coordination duties much of which took place within the Site Office Trailer.

A final interview took place to permit the analysts to clarify points and to gain greater insight into the jobs through the application of an analytical tool from the research area of Literacy Task Analysis. A technique outlined in Literacy Task Analysis - A Manual for Workplace Trainers, written by Glenda Lewe and Maurice Taylor was modified to facilitate the gathering of additional information on each job. The resulting **Task Correlation Technique** sought information on the main job tasks in terms of their difficulty (as perceived by the incumbent), the language and math requirements within each task, the time spent on the task and the special training required to do it. As in the PCL Study, where different techniques from the research area were used, this step provided a framework for the workers to talk about their jobs in a more thoughtful and insightful way.

PROFILE OF THE CARPENTER APPRENTICE

The Carpenter Apprentice works under the direction of the Carpenter Foreman. The Carpenter serves an important role in showing the apprentice how to do various tasks.

The main duties of the Carpenter Apprentice interviewed were: putting up walls, bracing, levelling, stripping forms, on site surveying and layout. Building forms (panels) takes up a great deal of time at the beginning of the job, but forms are reusable. This apprentice also pours and finishes concrete.

Tools used are the same as those used by the Carpenter, and includes Skilsaw, hammer, torches, Hilti gun and drills.

Physical work is quite intensive with the apprentice lifting weights of up to 200 pounds by himself. It is important to note, however, that some of this lifting, such as 4 x 8 panels could be done by two workers working together rather than one.

Reading tends to be found on boxes and tubes rather than in manuals or documents and generally involves following directions. The instructions for Hilti guns and on epoxy tubes are examples.

The Carpenter Apprentice uses sketches prepared by the super or the Foreman in order to understand the scope of the job he is required to do. These drawings are referred to by the apprentice as "dummy" drawings.

Figures are jotted on pieces of wood. Algebra and volumes are important functions of the job, as are hypotenuses, fractions and decimals. Tape measures and rod sticks are used frequently.

The Carpenter Apprentice is not expected to be familiar with blueprints, although they are available, and "anyone can look at them".

Accuracy is essential, especially in regard to the exposed part of the concrete and the bolt templates. Tolerances are tight - to 1/64 of an inch.

A pre-apprenticeship course provides an excellent starting point for an apprenticeship, although it is not obligatory. Math aptitude is important, and the apprentice interviewed feels that grade 12 math is needed.

The apprentice works closely with the Carpenter. Checking of work is done by the Foreman, and frequency varies depending on the job.

The Carpenter Apprentice works closely with other trades and needs to display a positive attitude of teamwork. This is not always easy to accomplish given the fact that subtrades are often working in the same space with competing priorities.

The Carpenter Apprentice has a pre-determined order of work and there is little scope for independent decision making, except in the area of safety where it is incumbent on the apprentice to point out hazards.

As far as responsibility for equipment is concerned, the Carpenter Apprentice is responsible for his own tools.

Contacts are limited, since generally Foremen deal with the Superintendent and with other Foremen to get the job done.

Problem solving and negotiating on the job site is constant as workers exchange suggestions as to how best to accomplish a job.

There are no telephone contacts.

The physical environment is mainly out of doors except when finishing work is being done. Some work is done within confined space.

Even though the functions to be accomplished on each job are similar, every job is different and provides variety.

The career goal of the Carpenter Apprentice interviewed is to become a journeyman Carpenter and then a Carpenter Foreman.

THE SUPERINTENDENT

The Superintendent reports to the Project Manager/Estimator at Kingston Construction. The Carpenter Foreman reports to him.

The Superintendent sees his main job as controlling dollars and time. The Superintendent works closely with the Project Manager who lines up the subtrades and does the costing of the job. The Superintendent is in charge of the construction principles and practices. Working with the Project Manager, the Superintendent assists in evaluating tenders, and then schedules out the job.

At the job site observed on Conway Avenue, the Superintendent is playing a dual role, since he is also Carpenter Foreman on Building A. There is another Carpenter Foreman for Building B.

The Superintendent, more than anyone else on the site, is responsible for seeing the broad picture. People skills are very important in motivating workers to their best performance.

A key requirement is that the Superintendent coordinate supplies and equipment in such a way that the workers are able to move from one task to another without delay. Planning is thus critical. The Superintendent is constantly on the phone ordering supplies (e.g. - 4 loads of crushed stone calculated by volume), and confirming delivery times of previously placed orders. Prediction of man hours required to do each task is also part of the long range planning process.

It is important that the Superintendent direct the Foremen and then let them do their job. Organizing "blockouts" for the subtrade functions is essential and ensuring that each subtrade arrives in the proper order for completing the work. Timing is critical, and a knowledge of what "sub" should come first. If the electrician needs a conduit, he should come before the drywall provides a barrier. Coordination often involves jockeying the subtrades into the correct sequencing of work and insuring that their work proceeds with minimum disruption - to one another.

The Superintendent is responsible for safety on the job site and ensuring that there is full compliance with WCB rules. This is important both to protect worker safety and also to avoid fines to the company.

The blueprints are a key resource for the Superintendent. The Superintendent calls in the subtrades and goes over the plans in detail with them. He lets them know exactly what the company requires and gives them an opportunity to view how their function fits into the job as outlined in the prints.

The specifications which outline the scope of the project are also essential.

The Superintendent phones a wide range of inspectors to ensure their appearance at the appropriate time. The architect inspects for appearance; engineers for earthquake protection; and reinforcing steel inspectors for rebar. There are also inspectors for electrical, plumbing and hydro.

The Engineering Inspector comes to the site many times and the Superintendent must deal with his requests for changes - for example; providing greater fire protection in a wall. Such demands require that the Superintendent liaise with the Architect and/or the Project Manager to discuss remedies to problems encountered.

The Superintendent requires adaptability to respond to changes which may occur while the job is in progress. A changing building code in the middle of a job may affect work already completed passing inspection. The Superintendent needs good negotiating skills to work out acceptable compromises when they are possible.

Reading and writing requirements of the Superintendent go far beyond those of the subordinate positions. He completes daily reports showing manpower, hours and costs. He completes time sheets from a master format.

Memos written by the Superintendent will deal with safety or construction principles. Such memos will go to subtrade people on site, their supervisor and the Project Manager. While memos are not frequent, accuracy and professionalism are important at this level. A small Computer-speller aids the Superintendent to ensure correctness of spelling.

The Superintendent uses the fax machine to facilitate quick communication, and also to ensure that there is a paper record of critical decisions for later reference if necessary.

Reading functions entail integrating information from multiple sources and drawing conclusions. This is a high level reading skill. Besides specifications and blueprints, the Superintendent will read shop drawings from trades such as the glaziers and manuals of installation practices.

Independent judgement is required. The Superintendent must be able to determine if there is a problem with a drawing and be prepared to make recommendations - e.g. - recommending changing the position of a transformer on the architect's drawing. This means that the Superintendent must know when it is appropriate to make suggestions and have the confidence to make recommendations.

The Superintendent uses math when dealing with the prints. While taking elevations is the Foreman's job, the Superintendent will confirm that elevations are correct. Geometry, algebra and decimals are used. Knowledge of surveying is essential. A Superintendent needs experience on transit work to understand what the foremen are doing and confirm correctness. Incorrect layouts can result in major consequences and costs to the company.

The Superintendent sets the scene for the comprehensiveness of the Foreman's work, ensuring that survey work is checked and double checked, using the closed loop method of backtracking.

The Superintendent prepares the format for the drawings which foremen do for Carpenters. The intention is to facilitate the Carpenters work by reducing the amount of time they must spend in calculations. The Superintendent also does drawings for the subtrades to show them, for instance, what has to be done through the wall. The drawings remove the necessity for them to pore over the prints seeking what they need.

Accuracy is a prime requirement. There is no room for errors since they will cost the company money. In particular all delivery dates must be by strict schedule.

While information received from prints and specifications is essential, there is no source of information more important than the human source. Connecting with the knowledge of the crew is of prime significance. The Superintendent must know how to keep a cool head and how to calm those who have lost theirs. The knowledge of how to deal with people is probably just as important as knowing construction principles. It is also important for the Superintendent to avoid making unguarded promises regarding costs and changes.

Good memory retention is a decided asset for the Superintendent, although with experience less needs to be written down.

Reading comprehension skills must be advanced. Since finding items quickly is essential, skimming skills are needed. This ability to find items quickly is also required when searching for tiny notations on prints. Flexibility of thinking is required to locate items in locations other than where expected. Cross referencing of drawings occurs regularly.

Communication with the project manager occurs frequently by phone, and generally once a week in person. The Superintendent needs to have a detailed and thorough knowledge of everything happening on the job site so that he can respond to all questions of the Project Manager.

Generally speaking, the Superintendent does not deal with the project owner, but that can vary from job to job.

Negotiating is part of the Superintendent's form of communication. Firmness is required to get the job done.

While training is judged important, the Superintendent's perception is that he generally does not have time to devote to the training function. However, the Carpenter has a role in training the apprentice, and the foreman has a training role with the Carpenter. In a sense the Superintendent performs a training role for the Carpenter Foreman by modelling his behaviour. The Superintendent is aware that the better the Foreman is, the better the Superintendent will appear. The statement that "*You're only as good as your crew is*" is very evident on a construction project.

In a small company, the Superintendent will sometimes perform some duties generally ascribed to a Project Manager - for example, dealing directly with subs on prices.

The Superintendent's job offers variety. While individual functions are repeated, they are repeated over a long time span rather than every day. Each day presents a new context for decision making.

Career development options that exist would include taking an engineering degree or becoming a General Superintendent. The Superintendent interviewed in this study saw the latter as a logical next step.

COMPARISON- LARGE & SMALL COMPANY CONTEXT

A detailed profile of the Carpenter and the Carpenter Foreman appears in the report describing an earlier Literacy Task Analysis conducted at a PCL site in Burnaby. The following description builds upon the earlier study and presents a comparison of the Carpenter and Carpenter Foreman jobs as they are performed in a large and in a small company.

CARPENTER FOREMAN

The larger company senior foreman was compared to the smaller company foreman. Based on the similarity of responsibility and experience, this comparison seemed the closest match for the purpose of this study.

Similarities:

Planning and organizing are key job functions both in the large and small company. The foreman judges manpower and materials. He is responsible for making sure that time lines are respected.
Both Carpenter foremen mentioned that they worked at home, after hours to study the blueprints and to make detail drawings in preparation for the next day.

Coordinating subtrades is a high level skill which encompasses foreseeing difficulties, planning and negotiation. It seems to be a key area for cost effective management.

Math is used on a constant basis and requires a higher level of competency than the journeyman.

Blueprint reading is a key skill and requires the ability to look at several prints and assimilate the information. **Critical thinking** skills are required to determine discrepancies and errors in the plans.

The **instructing** role is evident in both job situations. Both had adapted several ways of showing others including, working with them, drawing simplified views, and explaining various procedures.

Safe construction procedures are viewed as a component of the foreman's job particularly from the viewpoint of company liability.

Experience is a necessary component for a Carpenter Foreman to perform the job well.

Supervision is light in both cases although in the large company, the supervisor generally comes to the job site just once a day, (unless things are going wrong), while in the small company, the Carpenter foreman is more likely to be performing the role of a general foreman.

Differences:

Physical "hands on" building was more evident in the smaller company.

In a large company, radio **contact** between foremen is frequent, while for the small company contact is more likely to be personal.

Cross Skilling was more prevalent on the smaller company site. Although it is possible that the large company foreman had knowledge of several trades, the foreman of the smaller company actually performs the job of a labourer, ironworker or cement mason for brief periods on occasion when such skills are needed briefly and no person of that trade is available.

Job Overlap is more evident in the smaller company. Sometimes the foreman acts as a superintendent. This widens his circle of contacts within and outside the company. In the smaller company there is less division of labour. The Foreman is required to do his own surveying for layouts. In the large company, a surveyor did this work.

Reading and Writing skills were seen as equally important as math by the smaller company Foreman. In the larger company, the Foreman had fewer writing responsibilities as these were assumed by the Superintendent.

The Carpenter Foreman in a large company will receive change orders in a box in the office, while these will be communicated from the Superintendent orally in a small company.

Safety with the smaller company was less formal as no one was specifically assigned to safety. Conversely, the Foreman was required by the smaller company to take a first aid course to compensate for the fact that there is no safety officer on site.

Equipment inventory was the responsibility of the smaller company Foreman, unlike the large company Foreman.

Although it may be the nature of the projects, the large company Foreman worked with seven to twelve Carpenters. The smaller company Foreman supervised under 6 workers but has a much broader range of tasks calling on a more diverse skill base.

CARPENTER

Similarities:

Math skills are particularly important. All functions, fractions, decimals, some geometry and some algebra are required. Measuring and conversions are used constantly.

Training: Both had been through the apprenticeship program and recognized that experience added to the proficiency of performing the job. Both had gained experience through their own business ventures and side jobs.

Instructing the apprentice was seen by both as a responsibility of the journeyman carpenter. The smaller company carpenter also mentioned explaining a procedure to a labourer so that he would understand, not simply take orders.

Reading and Writing duties are light.

Blueprint reading was seen as important and a daily activity.

Memory is necessary for remembering blueprint details, measurements and scheduling.

Supervision style was similar. The "what" and "when" are outlined with the "how" being left to the carpenter to determine.

Job Setting was similarly outside, although the nature of the larger company's work allowed for more shelter from weather conditions. The carpenter in the small company had been on several jobs that required working in confined spaces. The other carpenter was not questioned about other jobs.

Routine for both carpenters varied from day to day but fell into a pattern of repeated, established construction practices.

Differences:

Teamwork seemed to be a focus for the larger company carpenter which may be attributed to the fact that he worked with a composite crew of up to 12 workers. Interestingly, in the smaller company there was a feeling of family with relatives and friends all working together but the carpenter identified "making money for the company" as his main objective.

Differences in approach to **physical** work may be due to the nature of the job or perhaps personal attitudes to long term health care. In the smaller company the Carpenter seemed to carry heavier loads more often. This could be because helpers were not readily available.

Safety seemed more entrenched with the large company Carpenter which could be a result of having a more formalized approach to safety on the site. Almost contradictory is the fact that the carpenter in the smaller company had taken survival first aid as a requirement of the company and as a necessity because on some jobs it might happen that no first aid person was on site.

Blueprint reading seemed more important for the Carpenter of the smaller company.

Contact for the larger company Carpenter included other trades, Foremen and occasionally, the Superintendent. The chain of command seemed somewhat formal and availability of the Superintendent was limited. On the jobsite of the smaller company, the Superintendent was in much closer proximity to the "action". The Carpenter of the smaller company had much the same type of contact with trades and also had little contact with outsiders (architect, engineer, estimator). The difference is that the smaller company Carpenter had a greater sense of familiarity with the other workers, the Foreman, the Superintendent, personnel in the office and the President of the company.

Equipment was a responsibility that was taken on by the carpenter of the smaller company. He considered himself a "company guy" and was willing to make sure that company equipment was accounted for.

Surveying Skills were known by both carpenters, however, the larger company carpenter relied on a full time surveyor while the smaller company carpenter did his own layouts.

Cross Skilling was much more evident in the smaller company. The carpenter may be called on to work in other trades areas briefly to "get the job done".

THE TASK CORRELATION TECHNIQUE

The Task Correlation Technique is a modification of the Risk Assessment Technique used in job and task analysis. It was modified to capture more specific information on the language and math dimensions of tasks and the percentage of time spent on each function.

Each incumbent selected what he perceived as his most important tasks and described them under the categories of difficulty, language/math, time spent, and special training.
This technique does not provide a scientific look at the job since it is very personal in scope. It is interesting to note, for instance, that the highest level of difficulty (5 - very high) was chosen more often by the Carpenter Apprentice than the other workers in categorizing a task. This does not mean that the Carpenter Apprentice has more difficult work to do than the Carpenter, the Carpenter Foreman and the Superintendent - only that his perception of difficulty is that it is very high. This probably reflects the fact that the Carpenter Apprentice is still on a learning curve in which mastery is not yet complete and tasks may thus be regarded as being very difficult.

The information gathered through this technique relates to the present job (building the warehouse) rather than to past jobs. Given the diversity of jobs completed by each worker, the present job was established as a focus in order to gain some degree of comparability.

Percentages under "Time Spent" will not necessarily add to 100% since the workers interviewed were giving a "feeling" rather than a scientific measure.

It should be noted that the category "Special Training" brought out a variety of reactions - often to the type of training which should be available or would be helpful rather than to training already completed.

The technique was helpful in determining how basic skills are integrated into trade skills and thus was a valuable part of the analysis.

TASK CORRELATION TECHNIQUE

JOB TITLE: Carpenter Apprentice					
TASK: **Putting up walls**					
	1 very low	2 low	3 moderate	4 high	5 very high
difficulty	1	2	3	4	5
	"Reveals" in the wall, unusual shapes, materials used for construction, the physical setting and the height are all factors in determining difficulty.				
lang/math	1	2	3	4	5
	Measurement is especially important.				
time spent	1	2	3	4	5
	Could vary from job to job, but 50% on this job.				
special training	This is basic carpentry taught in the apprenticeship course, although this carpenter learned it on the job.				
TASK: **Stripping forms**					
difficulty	1	2	3	4	5
	Easy job although care must be taken not to damage forms that will be reused.				
lang/math	1	2	3	4	5
	Not needed.				
time spent	1	2	3	4	5
	It takes 3 to 4 hours to strip forms from 100 - 140 feet of wall.				
special training	This job is done by labourers when the forms are not being reused.				

JOB TITLE: Carpenter Apprentice					
TASK: **Bracing (A task associated with putting up walls)**					
	1 very low	2 low	3 moderate	4 high	5 very high
difficulty	1	2	3	4	5
	A job that has to be done correctly in order to withstand the pressure of the concrete.				
lang/math	1	2	3	4	5
	The building code book may be needed for reference to establish the number of braces in relationship to the height of the wall.				
time spent	1	2	3	4	5
	5% Directly correlates to the walls built.				
special training	Apprenticeship training.				
TASK: **Building panels (forms)**					
difficulty	1	2	3	4	5
	Can be repetitious.				
lang/math	1	2	3	4	5
	Requires measuring and positioning of drill holes for SNAP ties.				
time spent	1	2	3	4	5
	Forms are reused, only need to be constructed once.				
special training	Apprenticeship				

JOB TITLE: Carpenter Apprentice					
TASK: **Levelling (using a transit and level)**					
	1 very low	2 low	3 moderate	4 high	5 very high
difficulty	1	2	3	4	5
	"Shooting elevations" is difficult because there is virtually no room for error.				
lang/math	1	2	3	4 math	5
	Reading from the blueprints establishes elevation. Math is important in survey functions				
time spent	1	2	3	4	5
	Done only to establish the height of a concrete pour.				
special training	Requires specific training.				
TASK: **On site survey/layout**					
difficulty	1	2	3	4	5
	Placement needs to be exact.				
lang/math	1	2	3	4	5
	Math involves specialized functions such as seconds and degrees.				
time spent	1	2	3	4	5
special training	In a larger company the apprentice would have fewer opportunities to learn survey skills as a full time surveyor would be on site.				

JOB TITLE: Carpenter Apprentice					
TASK: **Pouring and Finishing Concrete**					
	1 very low	2 low	3 moderate	4 high	5 very high
difficulty	1	2	3	4	5
	This job requires a "feel" acquired through experience.				
lang/math	1	2	3	4	5
time spent	1	2	3	4	5
special training	Foreman had given apprentice some concrete to "play" with to develop a sense of the setting qualities.				

TASK CORRELATION TECHNIQUE

JOB TITLE: Carpenter					
TASK: **Forming**					
	1 very low	2 low	3 moderate	4 high	5 very high
difficulty	1	2	3	4	5
lang/math	1	2	3	4	5
	Reading blueprints and some addition is required.				
time spent	1	2	3	4	5
	90% of time on this job is spent in forming.				
special training	Forming was covered in apprenticeship training.				
TASK: **Layout**					
difficulty	1	2	3	4	5
	This is the most complex part of the job.				
lang/math	1	2	3	4	5
	Algebra and trigonometry are used.				
time spent	1	2	3	4	5
	5% of time is spent on layout.				
special training	A survey course would be useful in addition to several weeks in apprenticeship.				

JOB TITLE: Carpenter					
TASK: **Planning (moving from task to task)**					
	1 very low	2 low	3 moderate	4 high	5 very high
difficulty	1	2	3	4	5
	On this job planning is very low since the foreman is doing the planning. On some jobs this task can be moderate to high.				
lang/math	1	2	3	4	5
	There is a need to look at the prints to plan materials and manpower.				
time spent	1	2	3	4	5
	15% of time when it is a responsibility, 0% when it isn't.				
special training	"You pick it up on your own."				
TASK: **Pouring/placing /finishing concrete**					
difficulty	1	2	3	4	5
	"You work with a labourer but you control it."				
lang/math	1	2	3	4	5
	"This is "grunt" work."				
time spent	1	2	3	4	5
	10%				
special training	"At apprenticeship training you learn mixtures, strengths, water-cement ratio, slump, etc."				

JOB TITLE: Carpenter					
TASK: **Instructing Apprentice**					
	1 very low	2 low	3 moderate	4 high	5 very high
difficulty	1	2	3	4	5
	"It's not hard to model what you're doing."				
lang/math	1	2	3	4	5
	"You read plans together. I show him what's on the prints."				
time spent	1	2	3	4	5
	Time is spread out - hard to quantify.				
special training	There's no training for this. It's just a buddy system and teamwork.				

JOB TITLE: Carpenter Foreman					
TASK: **Layout using blueprints and survey equipment**					
	1 very low	2 low	3 moderate	4 high	5 very high
difficulty	1	2	3	**4**	5
	"Blueprints can cause difficulty if you don't spend enough time with them."				
lang/math	1	2	3	**4**	5
	"Literacy for blueprints is a whole area of concern. I carry prints to show the apprentice."				
time spent	1	2	**3**	4	5
	50% of time spent on this function.				
special training	Pre-apprenticeship and extra time with the instructor was more helpful than in apprenticeship training.				
TASK: **Coordinating Subtrades**					
difficulty	1	2	**3**	4	5
	Difficulty varies depending on whether they cooperate. Problems relate to scheduling and to getting work done to standard.				
lang/math	1	2	3	**4**	5
	Review prints with subtrades and review new codes when applicable.				
time spent	**1**	2	3	4	5
	On this job 20%; on most jobs 30% and up.				
special training	Field experience and help from pre-apprenticeship instructor.				

JOB TITLE: Carpenter Foreman					
TASK: **Designing formwork, making detail sheets, etc.**					
	1 very low	2 low	3 moderate	4 high	5 very high
difficulty	1	2	3	4	5
	This has to be done through a professional engineer.				
lang/math	1	2	3	4	5
	"To calculate pressure, you must take the height and thickness of the wall and decide on the rate of pour."				
time spent	1	2	3	4	5
	"After 8', the design is important regarding the rate of pour and temperature. Up to 4', you just pour it."				
special training	* experience, * use of Concrete Forming System, The Burke Company.				
TASK: **Instructing Apprentices and Journeymen**					
difficulty	1	2	3	4	5
	"Role is really general foreman as I supervise all trades - labourers and Operating Engineers."				
lang/math	1	2	3	4	5
	Oral communication is important - or show it to them if they have ESL needs.				
time spent	1	2	3	4	5
	This function is on going.				
special training	There is both formal and informal instruction - common sense rather that training. "I get apprentices to plot points, place footings according to drawings and then I verify his work."				

TASK CORRELATION TECHNIQUE

JOB TITLE: Superintendent

TASK: **Planning (Detailed scheduling of job)**					
	1 very low	2 low	3 moderate	4 high	5 very high
difficulty	1	2	3	**4**	5
	This task requires a diverse knowledge of the components of the job, especially the functions of all the trades.				
lang/math	1	2	**3 math**	**4 reading**	5
	High comprehension skills are required to interpret the specifications.				
time spent	**1**	2	3	4	5
	For a job of 120 days duration this takes about 2 days for an experienced superintendent.				
special training	* "thrown into" the job, * experience working in the office of a large company,* guidance from the estimator, * a computer program is available through the estimator, although he did not use it				
TASK: **Contact and coordination with sub trades**					
difficulty	1	2	**3**	4	5
	Dealing with people requires confidence. As a younger, less experienced superintendent this is particularly difficult.				
lang/math	1	2	**3**	4	5
	These skills are needed to verify data.				
time spent	1	**2**	3	4	5
	Interpersonal skills are important. Coordination happens daily, conflict resolution varies. 30% of the time is spent coordinating subs.				
special training	* modelling competent supervisors, *mentoring, This superintendent thought most "communication" courses offered in the community would be beneficial although he had not taken any.				

JOB TITLE: Superintendent					
TASK: **Directing Foremen from Blueprints and Specifications.**					
difficulty	1	2	3	4	5
	This superintendent may not see this function as difficult because he is very skilled in this area.				
lang/math	1	2	3 reading	4 math	5
	Reading and math are used to verify Foremen's work especially on critical items.				
time spent	1	2	3	4	5
	10 to 15%				
special training	A superintendent is dependent on others to carry out the work. Being able to motivate is a key skill that has not been addressed in specific training. Also, a self-awareness course would be useful.				
TASK: **Liaison with company management**					
difficulty	1	2	3	4	5
	The management is supportive and are available for assistance. He considers inside people as a "buffer".				
lang/math	1	2	3 math	4 reading	5
	There is need to show management that you can problem solve with the plans.				
time spent	1	2	3	4	5
	5 to 7 % More at the beginning of job, but throughout.				
special training	None available.				

JOB TITLE: Superintendent					
TASK: **Liaison with architects, engineer,inspector, owner, etc.**					
	1 very low	2 low	3 moderate	4 high	5 very high
difficulty	1	2	3	4	5
lang/math	1	2	3	4	5
	It is critical to be competent at interpreting all drawings as well as projecting and analyzing.				
time spent	1	2	3	4	5
	3%				
special training	A grade 12 level is assumed plus on site experience.				
TASK: **Decision Making (Foreseeing, Anticipating, Correcting, Rerouting)**					
difficulty	1	2	3	4	5
	Decision making is difficult because information must be drawn from a number of diverse sources and the consequences of error are significant.				
			3 math	4 reading	5
	Time is money and any time workers are unproductive the project loses money. Making the right decisions is dependent on a competent level of reading (blueprint, specification) and of math skill.				
time spent	1	2	3	4	5
	A great deal of time is spent going through procedures and sequences to make sure there are no crises. Monitoring is ongoing.				
special training	"Experience has been the best trainer. It takes years to understand the construction field."				

JOB TITLE: Superintendent					
TASK: **Paperwork (reports, memo, forms,accounting)**					
difficulty	1	2	3	4	5
	Drafting letters is difficult largely because of the "legal" nature of the content.				
lang/math	1	2 math	3 reading	4 writing	5
	The superintendent uses writing skills at a high level although there are very few opportunities for gaining experience in writing at the foreman level.				
time spent	1	2	3	4	5
	10%				
special training	*office can support, * some companies offer "in-house" training,* BCIT offers writing contract documents as a part of training project managers. This superintendent had office support to revise his drafts.				

RECOMMENDATIONS

1. LEGAL RESPONSIBILITIES

There is a need for information on legal responsibilities of workers in positions of authority.

Recommendation

That Superintendents and general Foremen be exposed to a clear language presentation of laws affecting construction.

Include: Liability law, Ministry of the Environment, Dept of Fisheries, WCB, Liquor law, hazardous waste disposal, etc.

That a number of weekly seminars, using guest speakers provide personnel with background information.

An important follow up to these sessions would be a "question and answer" document written in clear language for superintendents to use for reference.

Bulletins, outlining new laws and regulations could also be important as a source of updating information.

2. WRITING

Little writing is done on the path from Carpenter to Carpenter Foreman to Superintendent. Memos and faxes are exchanged sporadically. There seems to be a leap in writing tasks required at the Superintendent level, not so much in quantity but in significance of the documentation. Writing is specifically used to verify contractual agreements. Poorly worded letters or memos can result in financial loss to the company. Both foremen and superintendent felt a need "to appear competent" by their writing skills as well as by their trade skills.

Recommendation

That carpenter Foremen keep a daily journal to record the events of the day, noting any agreements made with subtrades and other foremen. This will provide some experience in writing leading to Superintendent duties.

That electronic devices such as "compute/spell" or dictionaries be readily available to encourage and improve spelling.

That *SkillPlan* provide resources (local community colleges, etc.) that offer writing courses. *SkillPlan* presently offers a two and a half day seminar on "Writing for Work" and an on going study session one night a month that focuses on writing in the construction industry.

3. INTERPERSONAL SKILLS

Emphasis was placed on what we have referred to in our earlier report as "management style" . The need for skills to motivate, to resolve conflict, to negotiate and to problem solve seem to be the key determinant in the success of a Superintendent and to a lesser degree of the Carpenter Foreman.

These skills need to be encouraged and developed at earlier levels to provide experience.

Recommendation

That *SkillPlan* make a list of local courses that address these topics or help to develop one that addresses specific industry context.

4. READING

Blueprints, specifications, and regulations are the main source documents for the Superintendent. The assimilation of materials from diverse sources and a need to locate information easily are high level reading skills that require training to perfect.

Recommendation

That reading upgrading courses of various degrees of complexity be available at all levels including Superintendents.

5. COMPUTER SKILLS

There is evidence everywhere in society that computer skills are becoming "basic". The construction industry is no different. Estimating and cost accounting are commonly done with the aid of computer programs.

Recommendations

That Senior Foremen be encouraged to take a basic keyboard course and become acquainted with appropriate software to prepare for advancement to General Foreman or Superintendent.

That Superintendents enroll in appropriate computer courses in accordance to their skill level, functions, and career aspirations.

6. MENTORING/COACHING

Study of the smaller jobsite brought home the fact that being a supervisor can be somewhat lonely. While the Apprentice, the Journeyman Carpenter, and the Carpenter Foreman all have an established tradition of a fellow workers instructing and guiding, the Superindentent can be left without a support system.

Recommendation

That in order to encourage an exchange of ideas and to promote the learning culture it may be useful to have a monthly meeting with a feature speaker or some structured discussion of areas of concern.

That follow up through a "mentor/coach" program may be helpful to support long term growth.

An appropriate body (union? management?) should take on the task of documenting innovative trends and construction methods to recognize individuals who are successful "problem solvers".

7. BLUEPRINTS

Before the technical aspects of blueprints can be understood and assimilated, there must be a certain degree of basic literacy competence, in relation both to words and concepts. Supervisors sometimes presuppose a competence in this area which may not be there.

Recommendation

That *SkillPlan* work with the industry to put together a Basics for Blueprint Reading course, drawing upon the expertise of tradespersons who are sensitive to the ways in which literacy and basic skills form the foundation stones on which technical blueprint reading skills can later be built.

CONCLUSION

The Literacy Task Analysis of the Carpenter and the Carpenter Foreman at the Kingston Construction site added insight to the earlier view of similar positions at the PCL site in Burnaby. An examination of the duties of the Carpenter Apprentice and the Superintendent at the Kingston Construction site provided an additional layer of information to the earlier study where these two positions were not examined.

It is clear from the information presented in this report that the size of a company affects the ways in which the Carpenter and Carpenter Foremen perform their duties. The security and conformity of a large compnay may be viewed as advantages for some workers, while others may prefer the diversity and greater range of activities found working for a smaller company.

It seems that in both the large and small companies the workers who had reached the highest competence levels were those who had picked up various skills beyond the immedite context of the job within the context of other trades and project management. Communication skills were mentioned as essential, yet little or no training was provided by the companies to hone such skills. Communications involving oral as well as written interactions and drawing from real workplace situations could provide an excellent training vehicle for workers, especially those who aspire to supervisory positions.

There is a great deal of mentoring and instructing taking place on the job site in both the large and small company. Some of the workers we met have natural teaching talent and the personality to provide information and training in a way which motivates and empowers. While this is a natural talent for some, it is an acquired skill for others. Knowing more about learning styles and the ways to encourage workers to fuller confidence could assist some aspirants to supervisory positions. We met several workers who would make excellent role models in this regard and who could contribute to the design and instruction of such a course. *SkillPlan* would be happy to work with the industry to fuller develop this concept if there is interest in our performing this role.

We realize that in a sense we have obtained an idealized picture of the various jobs studied. In both the PCL and the Kingston Construction studies, we requested high level performers for our interviews and observations. We did this in order to view jobs as they can and should be done when done well. We also chose this approach to avoid a "deficiency" model of identifying training needs. It is our view that training paths begin with viewing competent workers rather than those who are less so. We are aware, however, that all workers do not reach the level of expertise of those we studied. One worker interviewed said, *"Some of the new guys are hopeless. They don't even know what a waler or a chamfer is. They're bush carpenters."* While this may be an extreme statement, it does indicate that some workers may require considerable basic skills upgrading to reach fully functional levels.

When viewed together, the Literacy Task Analyses at the PCL and the Kingston Construction sites provide food for thought in a number of training areas. They provide a framework for the

development of basic skills training curricula which respect the realities of actual jobs, functions and career ladders. We will be happy to flesh out this framework after decision makers in the industry make known their preferences for attention.

We look forward to discussing the reports with management of the two companies studied and with members of the Joint Board. If there are areas of the reports which raise new horizons for further study, we will be happy to discuss ways in which *SkillPlan* can be of further assistance.

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APPENDIX I

STRUCTURED JOB ANALYSIS INTERVIEW

Place in the organization

1. What is your job title?

2. What trade do you work in?

3. What jobs are immediately above yours?

4. What jobs are immediately below yours?

Main objective

5. What do you see as the main objective of your job?

Main duties

6. a What are your main duties/activities?
   b How important are each of these to your work?
   c What proportion of your time do you spend on each of these duties?

Duties and responsibilities

7. a What tools and equipment do you use?
   b What do you use each of them for?
   c How important are they to your work?
   d How often do you use them?

8. a What aspects of your work require physical effort, i.e, carrying, pushing, pulling?
   b What do you have to do?
   c What sort of weight/force/pressure is involved?
   d How often do you have to do this?

9. a What written materials do you use as sources of information, e.g.notes, reports, memos, etc.?
   b What do you use them for?
   c How important are they to your work?
   d How often do you use them?

10. a What writing do you do, e.g. reports, memos, forms, fax?
    b Who do you generally write to?
    c Generally, what is the content of the written work?
    d How do you decide what you have to write?
    e How often do you have to write things?

11. a What materials do you use involving figures, tables of numbers, etc?
    b What do you use them for?
    c How important are they to your work?
    d How often do you use them?

12. a What figure work/calculations do you have to do?
    b What do you have to do it for?
    c What is the highest level of arithmetic you require (e.g.working with decimals and fractions, algebra, etc)?
    d How often do you work with figures?

13. a Do you use maps, graphs, diagrams, blueprints or pictorial materials in your work?
    b What do you use them for?
    c How important are they?
    d How often do you use them?

14. a Do you ever have to produce drawings/maps/charts/diagrams, etc?
    b For what reasons?
    c How often do you do this?

15. a Which aspects of your work, if any, require you to work accurately?
    b What would the consequences be if you were not accurate in those areas?

16. a What other sources of information do you use in your work?
    b For what reason?
    c How important are they?

17. a Are trades qualifications required for this job?
    b What level of education is needed to be able to perform this work?

18. a Is previous experience required to perform this job?
    b If yes,what sort of experience is required? Be as specific as you can.
    c Why do you think that?
    d What is the minimum amount of time in which a person could have obtained such experience?

19. a How much supervision do you receive?
    b How much contact do you have with your supervisor?
    c How does your supervisor know if your work is up to standard?

20. a How many people do you supervise?
    b How many trades?
    c What does that involve?

21. How do you decide the order in which to carry out your work? (i.e.is it predetermined or are you free to set your own priorities?)

22. a What planning or organizing do you have to do?
    b What do you have to do it for?
    c How important is it to your work?
    d How often do you have to do it?

23. a How responsible are you for the safety of others?
    b What does this involve?
    c How important is this?

24. a What sorts of equipment, material, money are you directly responsible for?
    b What does this involve?
    c How important is this?

Contract with others

25. a What people do you come into contact with in the organization?
    b For what reason?
    c How important is contact with each of these people?
    d How often do you come into contact with each of these people?

26. a What people from outside the organization do you come into contact with?
    b For what reason?
    c How important is contact with each of these people?
    d How often do you come into contact with each of these people?

27. a Is there any negotiating/interviewing/training/public speaking involved?
    b For what reason?
    c What does it involve?
    d How important is it?
    e How often do you have to do it?

28. a What are the major forms of contact (e.g. personal contact, telephone, letters, memos, fax, etc)?
    b How important are these forms of contact?
    c How often do you use them:

Physical environment

29. a Is the majority of your work indoors or outdoors?
    b What proportion of time is spent indoors\outdoors?

30. How many people do you work with most of the time?

31. What are the physical conditions like (e.g. light, heat, space, etc.)

32. a To what extent do routines and procedures have to be followed?
    b For which activities?
    c How much time do you spend working under such routines and procedures?

33. What are the prospects for future development?

Adapted from: Job Analysis, A Practical Guide for Managers, Pearn, M and Kandola, R., Institute of Personnel Management, Wimbledon, London, 1988, p.126-129

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